

TOYOSAWA et al
Serial No. 09/598,169

REMARKS

Reconsideration of this application is respectfully requested. This amendment after a final rejection should be entered because the claim amendments are minor, see changes to claims 16, 26, and 27, or clearly place this application in condition for allowance, see independent claims.

The rejection of claims 16, 26 and 27 as being indefinite has been overcome by amendment in the manner suggested in the Action.

Further, the independent claims (except for claim 25) have been amended to make more clear that the pad metal substantially covers an active element, including its diffusion layers and a gate electrode. This covering arrangement is not disclosed or suggested in the prior art Ng patent. Further, the rejections of the last Action are based on an interpretation that the claims did not previously require the pad metal to cover the active element. This basis for the rejections has been overcome by the present amendments. Accordingly, the rejections should be withdrawn.

Claims 25 and 26 have been amended to state that the plurality of interlayer insulating films and plurality of other metal wiring layers are "vertically aligned" above the active element. No such vertical alignment is disclosed in Ng.

The rejection of claims 14, 15, 22 and 25 as being anticipated by Ng (US Patent No. 5,843,839) are traversed.

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I. CLAIMS 14, 15 AND 22

Contrary to the Action, Ng in Figure 12 does not disclose a barrier layer (41) over an insulating film (8, 23) and an active element (3, 4, 5, 6 and 7). The contact columns disclosed in Ng do not cover the active element, interlayer insulating film(s) or any barrier metal layer. The Ng interlayer contact columns stand on either side of the dielectric layers and insulating layer.

Ng, as shown in its Figure 12, has a metal contact column for a semiconductor device that connects an active source/drain region (7) on a substrate (1) to a top (fourth) interconnect metallization structure (24). The metal contact column extends between the source/drain region and the fourth interconnect metallization structure. The Ng contact column includes a contact plug (10(b)), a first level interconnect metallization structure (12b), barrier layer (40), second level interconnect metallization structure (17b), plug (20), third level interconnect metallization structure (22), and barrier layer (41). A second contact column, opposite the first column, is formed by 10(c), 12(c), 40, 17(c), 20, 22 and 41. A pair of contact columns are formed on opposite sides of dielectric layers (14, 16, 18) and insulator layer 23.

Between the plug columns of in Ng are three stacked levels. The lower level is formed of dielectric layers (14, 16) and SOG level 15. The middle dielectric level (18) and upper insulating level (23) also appear to be each formed of three layers. Unlike the present invention, Ng does not disclose a structure in which a pad metal is provided on an interlayer insulating film via a barrier metal layer at an upper portion of an active element

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which includes at least two diffusion layers and a gate electrode. In Ng, the pad metal does not substantially cover the two diffusion layers and the gate electrode of the active element. Moreover, the pad metal is not provided on the interlayer insulating film via the barrier metal layer, as in the present invention.

II. CLAIM 25

Contrary to the Action at para. 4, Ng does not disclose a "vertical alignment" of metal wiring layers and interlayer insulating films, as is recited in claim 25. In Ng (as shown in FIG. 12) the barrier layers (40, 41) are provided (i) between the first level interconnect metallization structures (12b, 12c) and the second wiring metal structures (17b, 17c), and (ii) between the third level interconnect metallization structure (22) and the fourth interconnect metallization structure (24). The dielectric layer (18) is provided between the second level interconnect metallization structures (17b, 17c) and the third level interconnect metallization structure (22). Therefore, Ng does teach interlayer insulating films provided between metal wiring layers, as called for in claim 25.

Moreover, unlike the present invention, Ng does not suggest a technique to prevent exfoliation of lower portions of an electrode pad which is brought about by a local damage given upon bonding the electrode pad. Prevention of exfoliation is an advantage of the present invention. Spec. pp. 11-13. A barrier metal made of a refractory metal such as tantalum and the interlayer insulating film made of PSG or BPSG do not adhere to each other; and an interlayer insulating film made of a mechanically fragile spin-on-glass (SOG) layer exists under the electrode pad. Because Ng does not disclose a

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metal pad over a barrier level or interlayer insulating film, it does not address the exfoliation problem solved by the present invention.

III. DEPENDENT CLAIMS 16 AND 27

The rejection of dependent claim 16 and 27 as being obvious over Ng in view of Hosomi et al (US Patent No. 5,773,888) is traversed for at least the same reasons stated above with respect to claim 14, on which depend claim 16 and 27. The passivation film (3) disclosed in Hosomi is applied outside the context of the present invention involving layers over an active element having insulating films, metal wiring layers, and a pad metal. Moreover, there is no suggestion to combine the Hosomi passivation film with the semiconductor structure shown in Ng because Hosomi et al do not suggest that stress induced by bonding may be alleviated by a passivation film that covers a large portion of a pad metal. It would not have been obvious to apply Hosomi et al to modify the semiconductor device disclosed in Ng in order to form the claimed invention.

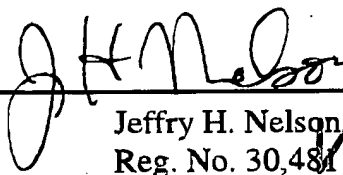
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All claims are in good condition for allowance. If any small matter remains outstanding, the Examiner is requested to telephone applicants' attorney. Prompt reconsideration and allowance of this application would be appreciated.

Respectfully submitted,

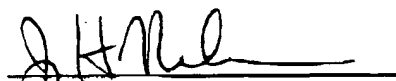
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I hereby certify that this Amendment After
Final Rejection is being filed with the USPTO
today, May 13, 2003.


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